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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/775,566	02/10/2004	Fotios Papadimitrakopoulos	UCT-0045	1441

23413 7590 08/14/2007

CANTOR COLBURN, LLP
55 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

EXAMINER	
DRODGE, JOSEPH W	

ART UNIT	PAPER NUMBER
1723	

MAIL DATE	DELIVERY MODE
08/14/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/775,566	PAPADIMITRAKOPOULOS, FOTIOS	
	Examiner	Art Unit	
	Joseph W. Drodge	1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smalley et al PGPUBS Document US2004/0040834, as supported by Provisional Application 60/390,887 (filed June 24, 2002) in view of Schleier-Smith et al patent 6,669,918 and further in view of Haddon et al patents 6,187,823 and 6,368,569.

Smalley et al disclose suspending single wall nanotubes (SWNT's) in a suspending solvent, and employing any of various means of selectively precipitating either the metallic (met) SWNT's or semiconducting (sem) SWNT's by selective sorption (not employing a template), while leaving the other component(s) in suspension in the solvent. See paragraphs 63-83 of the Smalley et al PGPUBS Document and pages 1-5 of the Smalley et al provisional application.

The claims now all differ in requiring that the SWNTs that are suspended in solution are functionalized.

Schleier-Smith et al '918 discloses suspending a population of mixed single wall nanotubes (SWNT) in a suspending solvent of water and/or sulfuric or nitric acid (column 4, lines 28-36 and 54-56 with column 5, lines 43-48) or in a surfactant/solvent mixture (column 5, lines 44-48) , containing mixed *metSWNT* and *semSWNT* nanotubes (column 1, lines 60-65) , followed by separation steps to separate the types of SWNT, including a type of selective precipitation of *met* or *sem SWNT, concerning deposition of nanotubes having a selected chirality corresponding to the chirality of either semiconducting or metallic nanotubes, on a template (column 3, lines 24-34 and column 4, lines 62-column 5, line 4).* The types of SWNTs having different chirality also have different geometry including diameters as discussed at column 3, lines 36-55 and figures 1A, 1B and 2) or different diameter ranges [as in independent claim 19]. The selective separation/deposition/precipitation also concerns selective solvent evaporation (column 5, lines 4-12 and lines 25-33).

With regard to claim 14, separation of types of nanotubes, in Schleier-Smith is completed by extraction of the more precipitated type into a solvent (column 5, lines 4-11).

Prior to the separation precipitation and solvent extraction steps, the SWNTs are also functionalized by action of amines or amides {stating that such functionalization is "described" in the applied Haddon '823 teaching reference}, which are inherently acid or base compounds and surfactant (column 5, lines 12-24 in combination with column 6, lines 49-52 indicating that sequences or order of method steps may be reversed or interposed). Hence, such functionalization as disclosed inherently involves "non-acid functionalizing. Haddon '823 clarifies at column 2, lines 9-38 that such functionalizing concerns end groups such as alkylaryl amines, while related Haddon '569 contrasts steps of functionalizing with alkylaryl amines and steps of acid functionalizing with carboxylic and/or mineral acids at column 2, lines 9-40.

It is unclear in Schleier-Smith et al '918 whether such functionalization occurs prior to the suspending step as in claims 1 and 19 or contact with a surfactant amine as in claim 14; thus the claims differ in explicitly requiring that the functionalization precede the separation step. With regard to independent claims 1 and 19, Haddon et al '569 teach functionalizing of SWNTs before shortening (column 1, lines 13-17 and column 2, lines 9-56, etc.). It would have been obvious to one of ordinary skill in the art at the time of the invention, to have proceeded with functionalizing steps to the SWNT's separation by applying of the solvent and selective precipitation, , as taught by Haddon '569, since such functionalizing would result in a greater variety of SWNT end products with wider

application and to facilitate streamlined manufacture of the SWNT components for specialized predetermined applications.

Claim 14 also differs in requiring the functionalized SWNTs to contact a surfactant amine, as also required or optional in claims 4-8,10-13,20 and 21. However, '918 incorporates functionalization steps of '823 at least before the deposition/precipitation step (see column 5, lines 20-24), with the amines listed in '823 being of the surfactant type (column 6, lines 32-43), (also see column 5, lines 9-23 of '569). It would have also been obvious to have contacted the functionalized SWNTs with surfactant amine, as taught by the Haddon et al patents, to increase their solubility, hence selective separation and also subsequent handling and processing.

The following is further disclosed by Schleier-Smith:

Regarding claim 2, the SWNTs being of carbon is found by '918 beginning at column 1, lines 42-43, also see the Smalley et al abstract.

Regarding claims 3 and 20, temperature change assisted separation steps are found at column 5, lines 26-31 of '918 and also in certain examples of '823 and '569 (also see paragraph 81 of Smalley et al).

Regarding claims 4 and 9, use of acids are found at column lines 31-33, etc. of '918 and in the Detailed Description of the Haddon (also see paragraphs 78-80 of the Smalley et al PUBS document and the Smalley provisional).

With regard to claims 5-8,11 and 14-18, ***and claim 21,*** see additionally differ in requiring the surfactant to be an amine. Smalley et al does disclose suspending in a surfactant-containing solvent (PUBS Abstract and page 1 of the provisional) and see Haddon et al '823 at column 2, lines 9-49; page 6, lines 25-53; column 8, lines 21-23, etc.

For claims 6 and 11, ***as well as claim 21,*** specific amines are detailed by Haddon '823 at column 2, lines 21-29 and column 6, lines 32-43.

Claims 7,12,13 and 15-17, ***as well as claims 22 and 23,*** differ in requiring the solvent employed to be one of various types of polar or non-polar organic solvent. Smalley teaches polar solvents (paragraph 59). Haddon '823 also teaches a wide variety of solvents, including polar and non-polar types, ethers, aromatic hydrocarbons, alkyl hydrocarbons, etc. (see column 2, lines 38-46 and 54-65 and also column 3,lines 32-38). It would have been further obvious to one of ordinary skill in the art to have utilized the organic solvents taught by Haddon with the Schleier et al '918 process/method, to enable a plurality of chemical reactions to occur at the ends of the SWNT molecules tailored to a variety of specific industrial applications.

Applicant's arguments with respect to claims 1-23 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Drodge at telephone number 571-272-1140. The examiner can normally be reached on Monday-Friday from

8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Roy Sample, can reached at 571-272-1376. The fax phone number for the examining group where this application is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either private PAIR or Public PAIR, and through Private PAIR only for unpublished applications. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have any questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).
JWD

August 10, 2006

JOSEPH DRODGE
PRIMARY EXAMINER

JOSEPH DRODGE
PRIMARY EXAMINER